round on the screws *w w*, and then secured by them and by the bolt, as shown by dotted lines, to give an additional elevation, the same rack *q*, giving the intermediate height between this position and the former.

Fig. 6 shows a bird's-eye view of one foot *y y*, and standards *p* and *s*, and part of the frame *u*. The painter gives additional steadiness to the rest, by putting one foot on the footboard *y y*, in front. The whole rest inclines from top to bottom about as much as an easel in use generally does, and the long feet go under the canvas to let it approach near enough.

N° III.

ENGRAVING ON STEEL PLATE.

The LARGE GOLD MEDAL *of the Society was this Session presented to Mr.* C. WARREN, *for his* IMPROVEMENTS IN THE ART OF ENGRAVING ON STEEL.

THE death of Mr. Warren, in the interval between the adjudication of the medal and the day of annual distribution of the rewards, has prevented the Society from receiving a written communication on this interesting subject from the inventor himself. The following statement, therefore, is taken from the report of the committee to the Society, and from details communicated by Mr. Warren's personal friends, especially

by Mr. Joseph Phelps, who was pupil to Mr. Warren during the whole progress of his experiments and discoveries.

Some of the earliest specimens of engraving on steel were produced by Albert Durer. There are four plates etched by this artist, impressions of which exist in the British Museum, which, in all books of art, are recorded as having been executed in steel; of these, one has the date 1510 inscribed on it. Since that time attempts have been made occasionally to employ steel instead of copper, as a material to engrave upon, but apparently with little success, on account, principally, of the great hardness of the material, which in a short time blunted and destroyed the tools which were made use of.

Steel exists in two states, the elastic and the brittle, the former being considerably softer than the latter; of the elastic steel, a saw-blade may be considered as an example, and, in fact, pieces of saw-blade were the material upon which nearly all the first attempts have been made, of late years, to revive a practice which, if successful, offered so many advantages to the artist and to the public. Mr. Raimbach, a few years ago, executed an engraving on a block, or thick plate of steel, but met with so many difficulties in the execution, that his experiment remained insulated, and produced no sensible effect on the art of engraving.

Mr. Warren, in his early youth, was much employed in engraving on metals for the use of calico printers and gunsmiths, and the experience thus acquired induced him afterwards to turn his mind to the subject, with a view of applying it to fine art. It was suggested to him by Mr. Gill, one of the chairmen of the Committee of Mechanics, that the method employed by the artists of Birmingham, in the manufacture of ornamented snuffers, and other articles of cast steel, is, to subject the steel, after having been rolled into sheets, to

the process of decarbonization, by means of which it is converted to a very pure soft iron; being then made into the required instrument, or other article, the ornamental work is engraved, or impressed, on the soft metallic surface, after which, by cementation with the proper materials, it is again converted superficially to steel, and thus rendered capable of acquiring the highest degree of polish.

In the attempt, however, to apply this process to plates for the engraver's use, two opposite difficulties occurred. A plate of steel, of the same thickness as that of common copper-plate, when thoroughly decarbonized and thus reduced to the state of very soft iron, yields readily to the graver and other tools, and, especially, is susceptible of the process of *knocking up;* this consists in scraping out the error, and afterwards striking the under side of the plate with a punch and hammer, in order to raise the cavity to the general level, and thus allow the artist to take the error out without occasioning any unevenness of the engraved surface: it was found, however, that plates of the thinness requisite for this operation and of the usual superficial dimensions, were very liable to warp in the last, or re-carbonizing process, and were thus rendered incapable of giving perfect impressions. If, in order to avoid this disadvantage, blocks, *i. e.* plates of three or four times the ordinary thickness, were made use of, the warping, indeed, was prevented, but at the same time the process of knocking up became impracticable, and it was necessary, in order to remove an error, or defective part, to grind out the surface, or to drill a hole from the under surface almost through the plate, and then, by forcing in a screw, to raise that part of the face which was immediately above it. This latter process, however, was so tedious and difficult as exceedingly to detract from the advantage of substituting steel for copper.

In this state of things it became a very interesting object of inquiry to ascertain how many impressions may be taken from a plate of soft or decarbonized steel; and it was found that such a plate, prepared according to Mr. Warren's process, is capable of affording several thousand copies without undergoing any sensible wear. In proof of this, impressions were laid before the committee by Mr. Warren, from two plates of decarbonized steel executed by him, the one for an edition of Mackenzie's works published by Cadell, the other for an edition of Beattie and Collins published by Rivington. These exhibit, both in the landscape and in the figures, the most elaborate and delicate work: five thousand impressions have been taken from one and four thousand from the other, and yet between one of the first and one of the last impressions it was impossible to detect any perceptible difference.

If Mr. Warren had carried on his experiments alone, working by himself till he had brought his plan to perfection, it is probable that, at the period of his death, the evidence of the great importance of his discovery would by no means have been so complete as it actually was, and the result of his exertions might have been lost, to the great detriment of the profession, and of the fair fame of this eminent artist: but selfishness and secrecy in any thing which related to the improvement of the art to which he was attached formed no part of his character; and all his discoveries, both those relating to the preparations of the plates, as well as those which have reference to the engraving upon them, were unreservedly and gratuitously communicated. The consequence of this liberality was, that besides the plates of Mr. Warren's own engraving produced before the committee, impressions were shown of portraits engraved on decarbonized steel, for the

Evangelical Magazine, demonstrating that, after 25,000 copies have been taken, the plates still remain in a good state, and are not yet in want of repair. Mr. Mar stated, that having made an engraving on one of Mr. Warren's plates, he did not take his own proofs till after the 8,000th impression; and, in another instance, the engraving being a portrait, Mr. La Hie, the printer, certified that the artist's own proofs were not taken off till after the 20,000th impression.

Mr. Warren's original process for decarbonizing the steel plates consisted in procuring a box, or case of iron, and covering the bottom of it with a mixture of iron turnings and pounded oyster shells; on this a steel plate is laid, another bed of the mixture is then added, and so on alternately, till the box is full, taking care that a bed of the composition shall form the upper as well as the lower layer. The box so charged, is then to be placed in a furnace, and to be kept for several hours at the highest heat which it will bear, without melting, after which, being allowed to cool gradually, the plates are found to be reduced, for the most part, to the state of soft decarbonized steel.

Mr. Hughes, a copper-plate maker, having been instructed by Mr. Warren in his process, and finding that the steel did not always turn out sufficiently and uniformly soft (particularly for the purpose of engravers in mezzo-tinto) imagined that those occasional defects were owing to a deficiency of heat in the cementing process; accordingly, he substituted a case or oven of refractory clay, for the cast iron one, and then, applying a considerably higher heat than the cast iron box would have endured without melting, was enabled to obtain plates so soft that they may be bent over the knee. Each plate requires two or more cementations; and, as the first cementation warps them more or less, Mr. Warren was in the

habit of rectifying them by means of a hammer. Mr. Hughes finds that the places struck by the hammer are apt to be less softened by the second cementation than the other parts, and, therefore, that plates so treated will often turn out unequal in hardness. His own practice is to use a mallet, and as little force as possible in detaching the cement from the surface and in rectifying the plate.

The plate being cleaned and polished (but not too highly), is ready for the engraver. When it comes into his hands, the first operation is, to lay the etching ground, in doing which the plate must be rather less heated than is usual with copper, otherwise the ground, as it cools, contracts, presenting a honey-combed surface and leaving parts of the plate uncovered. The same defect is apt to occur if the plate is too highly polished. The ground should be laid rather thicker than on copper.

Various menstruums were made trial of by Mr. Warren for biting in with. Nitric acid, considerably more diluted than for copper, was made use of with, upon the whole, good success. Nitrate of mercury was found to blunt or round the edges of the lines; acetic acid, with a small portion of nitrate of copper, produced the same effect; sulphate of copper bit light tints very beautifully, but its further action rendered the lines rough. The best menstruum, however, is half an ounce of crystallized nitrate of copper, dissolved in a pint and a half of distilled water, and a few drops of nitric acid added to the solution. This will be found to bite both deeper and clearer than dilute nitric acid.

It will be advisable for the artist, when first etching on steel plate, to keep a register of the time which he finds necessary for the menstruum to act before the parts have attained their due degrees of strength, and this will serve as a

guide to him in his subsequent operations. Mr. Warren generally found about two minutes sufficient for an outline, unless it was required to be very strong; the middle tint was produced in about ten minutes, and the darkest shadows in forty minutes. The menstruum should not be more than one-sixth of an inch deep on the plate, otherwise it will be difficult to see the work, and it becomes exhausted in about ten minutes, and then requires to be replaced. While the menstruum is acting, the work must be constantly swept with a camel-hair brush, in order to remove the precipitated copper, which, if allowed to remain in the lines, renders their edges rugged and destroys their beauty: especial care must be taken to clear the ends of the lines, as these are most liable to bite foul. In stopping out, the ground (Brunswick black) must be laid on very thin and even, and, instead of terminating abruptly, must be smoothed off very gradually; for the smallest ridge or prominence will retain the copper, and then the ground will infallibly be penetrated, and the biting will become foul. By attending to these directions, an etching may be obtained on decarbonized steel as deep and quite as sharp as it can be on copper.

Concerning the great superiority of steel-plate over copper-plate for all works that require a considerable number of impressions to be taken, there can exist no doubt: for though the use of the graver and of the other tools requires more time on steel than on copper, and though the process of re-biting has not yet been carried to the degree of perfection in the former that it has been in the latter, yet the texture of steel is such as to admit of more delicate work than copper; and the finest and most elaborate exertions of the art, which on copper would soon wear so as to reduce them to an indistinct smeary tint, appear to undergo scarcely any deterioration on steel;

even the marks of the burnisher are still distinguishable after several thousand impressions.

Both the public and the artist are eminently benefitted by this discovery; the public, by having a multitude of impressions as good as copper-plate proofs, and the artist in greatly extending the range of his reputation by the permanence thus given to the finest and most characteristic touches of his hand.

N° IV.

TAKING CASTS OF LEAVES AND FOLIAGE.

The SILVER ISIS MEDAL *was this Session presented to Mr.* W. DEEBLE, *of Seymour Place, Islington, for his* METHOD OF TAKING CASTS OF LEAVES AND FOLIAGE, *Specimens of which have been placed in the Society's Repository.*

SIR; 1, Seymour-place, Islington.

I HAVE ventured to offer to the notice of the Society of Arts, &c. a specimen selected from casts of leaves and other parts of plants, obtained by a process which, though very simple, is, for any thing I know to the contrary, new.

The object I proposed in making casts similar to the one now submitted, was to supply myself with fac-similes of the form and texture of those plants, which, as an engraver, I might have to introduce in the foreground of landscapes. It